Fermilab

PPD/MD/Engineering Analysis Group

A Preliminary Result for Several Different Cell Size
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**Table 1 A Summary of the Calculation Result for a Minimum Wall Thickness
Based on Several Different Cell Sizes**

Case	The Cell Size (mm) (High X Beam direction)		The Min. Wall Thickness (mm) Side wall X Web	
*Ref	38.8	45	3	2
1	38.8	60	3	2
2	38.8	90	3	3
3	52.4	45	4.5	2
4	79.5	45	7	3
5	52.4	60	4.5	3
6	79.5	90	7	4

Note: A matrix of criterion is used to determine the wall thickness:
1) To maintain the operating stress around 1,500 ~ 1,600 psi for the vertical extrusion (under 21 psi) standing along, or below 1,000 psi for the gluing two extrusions together as same as the reference case. Only interior cell is considered.
2) The horizontal extrusion will at least have SF>4~5 or more against the lowest cell buckling (pancake mode) and maintain a working stress below 1,000 psi as well.
3) The 21 psi is also applied to the horizontal extrusion to check the web thickness based on one of the possible failure mode (rib buckling under 21 psi) as same as reference case. SF should be at least > 3~4 or more.
4) Above result is considered to be preliminary. However, it should be good enough for the purpose of the PVC estimation.

Table -2 Details of the Calculation Result

Case	Cell size High/ Beam dir	Wall Thickness tside/tweb	Stress psi (for vertical extrusion under 21 psi standing along)	Horizontal Extrusion		SF (Web subjected to 21 psi)
				SF (for lowest cell buckling)	Working stress psi	
*Ref	38.8/45	3/2	1,491	11	432	5
1	38.8/60	3/2	1,491	7.7	578	3
2	38.8/90	3/3	1,485	5.5	866	3.5
3	52.4/45	4.5/2	1,420	18	305	4.5
4	79.5/45	7/3	1,606	31	224	9
5	52.4/60	4.5/3	1433	14	406	6.7
6	79.5/90	7/4	1,622	15	406	5